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Does transumbilical incision increase incisional hernia at the extraction site of laparoscopic anterior resection?☆

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Abstract

BACKGROUND: It is unclear whether transumbilical incision for laparoscopic colectomy has a risk of incisional hernia at the extraction site similar to left lower incision.

METHODS: Consecutive patients who underwent laparoscopic sigmoid plus high and low anterior resection between August 2008 and February 2011 were included in the study. Incision for specimen extraction was changed from left lower to transumbilical incision in February 2010. The main outcome was the incidence of incisional hernia diagnosed by computed tomography.

RESULTS: One hundred and eighty-six patients underwent laparoscopic anterior resection (94 transumbilical incisions and 92 left lower transverse incisions). Three percent of patients had an incisional hernia at the extraction site, and the incidence of this phenomenon was not significantly different between the 2 groups. Surgical wound infection was lower in the transumbilical incision group than in the left lower incision group.

CONCLUSIONS: Extraction site for transumbilical incision may not affect the risk of incisional hernia.

Incisional hernia is a common postoperative complication after abdominal surgery.[1] This long-term complication of laparotomy can impose significant morbidity and expense, with a need for additional surgical procedures.[2] Furthermore, approximately 25% of these hernias recur after primary repair.[3]

Whether laparoscopic colectomy reduces the risk of incisional hernia remains unclear.[4–6] Some studies evaluated the site of specimen extraction with respect to hernia formation. Several of these studies reported that midline incision is associated with a higher risk of incisional hernia than other incisions.[7–9]

Left lower transverse incision has been conventionally selected for laparoscopic sigmoid plus high and low anterior resection. Because transumbilical incision was reported to decrease surgical site infection, it spread widely.[10] However, there are few studies that have addressed the development of incisional hernia after transumbilical incision for laparoscopic colectomy.[7,11]

The purpose of this study was to compare the incidence of incisional hernia between transumbilical incision and left lower transverse incision for specimen extraction for

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sigmoid colon cancer and rectal cancer resection with a double-stapling technique.

Methods

This was a retrospective study of consecutive patients who underwent laparoscopic colectomy at the Department of Gastroenterological Surgery, Saitama Medical University International Medical Center, Saitama, Japan, between August 2008 and February 2011. From the beginning of the study period until February 2010, all laparoscopic sigmoid plus high and low anterior resections were performed with a left lower transverse incision for specimen extraction. In February 2010, the site of specimen extraction was changed to transumbilical incision. Patients undergoing laparoscopic surgery with sigmoid plus high and low anterior resection for colorectal cancer were included in the study. Patients who were converted to open surgery and could not be followed up by computed tomography for more than 6 months were excluded from the study.

All laparoscopic procedures were performed using a 5-port system. Vessel division and distal-side intestinal transection were intracorporeally performed. Specimens were extracted from a small incision of the umbilicus or a left lower site. The umbilicus was longitudinally incised through an extending camera-port incision superiorly to extract the specimen. The size of the incision was determined according to tumor size. The wound was closed with a single-layer fascial suture using absorbable thread and skin suturing. A left lower incision was transversely made, extending over the left lower port. This wound was closed with a single-layer oblique muscle suture. A wound protector was used at the extraction site in all patients.

Data were collected from the database of colorectal division, including sex, age, smoking, past history of respiratory disease, past history of diabetes mellitus, body mass index (BMI), past history of laparotomy, procedure, creation of diverting stoma, stage, maximum length of the tumor, blood loss, surgical duration, anastomotic leakage, surgical wound infection, postoperative hospital stay, follow-up for 2 or more year, and incisional hernia. The follow-up period was defined as the time from the surgery day to the last evaluation by computed tomography. A diagnosis of incisional hernia was determined by computed tomography of the skin incision site used for bowel extraction. Computed tomography was performed every 6 months after sigmoid plus high and low anterior resection. Patients were divided into 2 groups: the transumbilical incision group and the left lower transverse incision group.

Data were presented as mean ± standard deviation, unless otherwise specified. Statistical significance between means was determined using 2-tailed Student t test or analysis of variance. Welch's t test was used for continuous variables, and the chi-square test or Fisher's exact test was used for categorical variables. We used multivariate analysis model to identify the risk of incisional hernia from the incision site. The model included incision for extraction site, age, smoking, past history of respiratory disease, BMI, tumor size, follow-up for 2 or more years, and anastomotic leak. A P value of less than .05 was considered statistically significant for all tests. Statistical analyses were performed using JMP version 11 (SAS Institute, Inc, Cary, NC).

Results

Two hundred and six patients underwent laparoscopic sigmoid plus high and low anterior resection, 186 of whom (94 transumbilical incisions and 92 left lower transverse incisions) met the inclusion criteria described above.

Table 1 lists the basic demographic and characteristic information of the patients. Sex, age, diabetes mellitus, BMI, past history of laparotomy, procedure, creation of diverting stoma, and stage were similar between the 2 groups. Tumors were smaller in the transumbilical incision group than the left lower transverse incision group ($P = .02$).

Table 2 provides intraoperative and postoperative information. The incidence of incisional hernia at the extraction site was not significantly different between the 2 groups (1% vs 7%; $P = .06$). One of the 6 patients in the left lower transverse incision group who had an incisional hernia was diagnosed over 2 years after the surgery. One patient in the transumbilical incision group who had incisional hernia was diagnosed less than 2 years after surgery. Blood loss, anastomotic leakage, and follow-up for 2 or more years were also similar in the 2 groups. Operating time was shorter in the transumbilical incision group than it was in the left lower transverse incision group (196 vs 213 minutes; $P = .03$). The incidence of surgical wound infection was lower in the transumbilical incision group than in the left lower incision group (2% vs 10%; $P = .03$).

In Table 3, groups with or without hernia were compared. Overall, 3% (7/186) of the patients had an incisional hernia at the extraction site. Data, including sex, diabetes mellitus, BMI, type of surgery, stage, maximum tumor size, surgical duration, blood loss, surgical wound infection, and incision used for extraction, were comparable between the 2 groups. Patients in the hernia group were older than those in the nonhernia group (73 vs 64 years; $P = .04$). The frequency of anastomotic leakage was higher in the hernia group (29% vs 2%; $P = .02$).

In Table 4, multivariate statistical analysis, which involved incision for extraction site, age, smoking, past history of respiratory disease, BMI, tumor size, follow-up for 2 or more years, and anastomotic leak, was performed. The incidence of incisional hernia at the extraction site was not significantly different ($P = .20$).

Comments

It remains unclear whether laparoscopic colectomy reduces the incidence of incisional hernia.[4–6] Some studies

Table 1 Characteristics of patients in the 2 groups of incisions used for specimen extraction

	Transumbilical incision (n = 94)	Left lower transverse incision (n = 92)	P value
Sex			
Male	58	60	.65
Female	36	32	
Age	65.0 ± 10.4	64.5 ± 10.3	.72
Diabetes mellitus	8	9	.80
BMI	22.6 ± 3.6	22.8 ± 3.7	.65
Past history of laparotomy			
Major surgery	10	6	.14
Appendectomy	10	21	
Laparoscopy	1	1	
None	73	64	
Procedure			
Sigmoidectomy	43	51	.16
High anterior resection	31	19	
Low anterior resection	20	22	
Creation of diverting stoma	12	7	.33
Stage			
0	0	2	.25
1	30	21	
2	29	26	
3	29	32	
4	6	11	
Tumor size (cm)			
0–2.0	24	16	.02*
2.1–4.0	41	27	
4.1–6.0	23	40	
6.1+	6	9	

Data are expressed as mean ± standard deviation.
BMI = body mass index.
*Data have significant difference.

evaluated the site of specimen extraction with respect to hernia formation. Several of them showed that midline incision had a risk of incisional hernia that was as high as that of open surgery and had a higher risk of incisional hernia than transverse resection or Pfannenstiel incision.[7–9]

In this study, the risk of incisional hernia was similar between transumbilical incision and left lower transverse incision groups (1% vs 7%; P = .06), which was in contrast with the results of previous studies. It was similar to the results using multivariate analysis, including incision for extraction site, age, smoking, past history of respiratory disease, BMI, tumor size, follow-up for 2 or more years, and anastomotic leak. Moreover, subgroup analysis showed that the wound infection rate was lower in the transumbilical incision than in the left lower transverse incision group (2% vs 10%; P = .03). Regarding single incision laparoscopic procedures, Weiss et al retrospectively followed 1,145 patients who were operated with transumbilical

Table 2 Comparison of outcomes between the 2 groups

	Transumbilical incision (n = 94)	Left lower transverse incision (n = 92)	P value
Operation time (minutes)	196 ± 60	213 ± 49	.03*
Blood loss (mL)	15 ± 38	9 ± 9	.17
Postoperative complication			
Surgical wound infection	2 (2)	9 (10)	.03*
Anastomotic leak	2 (2)	4 (4)	.44
Postoperative hospital stay	9.4 ± 6.6	8.4 ± 6.6	.22
Follow-up for 2 or more years	82 (87)	77 (84)	.54
Incisional hernia of extraction site	1 (1)	6 (7)	.06

Data are expressed as mean ± standard deviation or number (percentage).
*Data have significant difference.

Table 3 Characteristics of patients with incisional hernia

	Hernia (n = 7)	Nonhernia (n = 179)	P value
Sex			
Male	4 (57)	117 (64)	.71
Female	3 (43)	65 (36)	
Age	73 ± 9.0	64 ± 10.2	.04
Diabetes mellitus	0	17 (9.5)	1.0
BMI	23.7 ± 2.8	22.7 ± 3.7	.47
Procedure			
Sigmoidectomy	3 (43)	91 (51)	.40
High anterior resection	1 (14)	49 (27)	
Low anterior resection	3 (43)	39 (22)	
Stage			
0	0 (0)	2 (1)	.57
1	0 (0)	51 (28)	
2	3 (43)	52 (28)	
3	3 (43)	58 (32)	
4	1 (14)	16 (9)	
Tumor size (cm)			
0–2.0	0 (0)	40 (22)	.54
2.1–4.0	3 (43)	65 (36)	
4.1–6.0	3 (43)	60 (34)	
6.1+	1 (14)	14 (8)	
Operation time (minutes)	219 ± 21	204 ± 4	.53
Blood loss (mL)	16 ± 22	12 ± 30	.76
Postoperative complication			
Surgical wound infection	1 (14)	6 (3)	.35
Anastomotic leak	2 (33)	4 (2)	.02
Incision for extraction site			
Transumbilical incision	1 (14)	93 (52)	.06
Left lower transverse incision	6 (86)	86 (48)	

Data are expressed as mean ± standard deviation or number (percentage).

incision: 707 patients underwent transumbilical incision and 364 patients underwent other types of incision. The rate of wound complication, including wound infection and incisional hernia, was 2.9% versus 2.2% (P = .55),[12] which was low compared with that reported in other studies.[5]

Only 2 currently available studies have estimated the rate of incisional hernia at different extraction sites, including transumbilical incision for laparoscopic colectomy. Lee et al retrospectively followed 99 patients who underwent laparoscopic colorectal surgery. All patients received either a midline incision that extended to the transumbilical port or a lower transverse incision and Pfannenstiel incision. After a mean follow-up of 37 months, midline extraction sites were associated with a 29% incidence of incisional hernia compared with 14% for low transverse incisions and 0% for Pfannenstiel incisions.[7] Lim et al prospectively followed 147 patients who underwent sigmoid plus high and low anterior resection using the double-stapling technique. All patients either had a midline incision that extended to the transumbilical port or a left lower transverse incision. A subgroup analysis showed that transumbilical incisions were associated with an incidence of wound-related complications of 15.2% versus 12.7% for left lower transverse incisions (P = .81). In addition, the incidence of incisional hernia after transumbilical incision was 2.1% and that after left lower incision was 0%.[11] This study and that performed by Lim et al exhibited similarities, in that none of them included hand-assisted surgery and sigmoid plus high and low anterior resection when comparing transumbilical incision with left lower incision.

A previous study reported that the length of the incision was a risk factor for incisional hernia.[5] Andersen et al

Table 4 Multivariate analysis for incisional hernia

	P value
Incision for extraction site	.20
Age	.04*
Smoking	.13
Past history of respiratory disease	.81
BMI	.45
Tumor size	.23
Follow-up for 2 or more years	.18
Anastomotic leak	.01*

BMI = body mass index.
*Data have significant difference.

retrospectively followed 143 patients who underwent resection of the sigmoid colon. The rate of incisional hernia was lower in the laparoscopic group than in the open surgery group (3.4% vs 14.7; $P = .03$).[13] Because the distal-side bowel is intracorporeally transected in sigmoid plus high and low anterior resection, the length of the incision may be shorter than that of right-side colon resection. Although the size of tumors was similar in the 2 groups analyzed in this study, transumbilical incisions and left lower incisions exhibited a similar risk of incisional hernia, which is in contrast with the results of previous studies that included right-side laparoscopic colon resection.

This study has several limitations. First, the follow-up period of the transumbilical incision group was shorter than that of the left lower transverse incision group. Mudge et al[14] reported that 44% incisional hernias were diagnosed within 1 year after surgery, and 79% incisional hernias were diagnosed within 3 years in a prospective cohort study of 564 patients who underwent major surgery with a 10-year follow-up. Because an average of 2 years of follow-up was recorded in both groups in this present study, the follow-up duration did not appear to affect incisional hernia rate. Second, the number of patients included in this study was relatively small. Only one case of incision hernia was observed in the left lower transverse incision group. The inclusion of a larger cohort may have led to the observation of significant differences between the 2 groups. Thus, a type 2 statistical error may be possible. The third was the diagnosis of incisional hernia. In this study, we diagnosed incisional hernia using computed tomography, which showed that bowels were extracted from the incisions. Because several patients develop hernias in the standing position, computed tomography may not be a good diagnostic tool. However, because it has been reported that 20% to 50% of patients with incisional hernia are asymptomatic,[13,15] computed tomography may be an adequate and stable method to detect incisional hernia.

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